CLAIMS

1. A multi-phase separation system for use in removing contaminants from fluids comprising:

a pre-filtering module for receiving and filtering a contaminated fluid to provide a filtered contaminated fluid;

a condenser module for receiving said filtered contaminated fluid and a contaminated gas phase for condensing of said contaminated gas phase to a contaminated liquid;

a phase reaction module comprising a phase reaction chamber for converting said filtered contaminated fluid to a contaminated mist, said mist subjected to a low energy, high vacuum environment for providing a first change of phase by separating into said contaminated gas phase and a liquid mist phase, said contaminated gas phase being carried out of said phase reaction chamber by a carrier air; and

a vacuum pump for providing said low energy, high vacuum environment in said phase reaction chamber and for delivering said contaminated gas phase to said condenser module to provide a second change of phase by said condensing.

2. The multi-phase separation system of Claim 1 wherein said pre-filtering module includes a specific gravity separator.

3. The multi-phase separation system of Claim 1 wherein said pre-filtering module includes a polypropylene screen for collecting oil suspended in said contaminated fluid.

4. The multi-phase separation system of Claim 1 wherein said pre-filtering module further includes a liquid waste storage tank for temporarily storing liquid waste.

5. The multi-phase separation system of Claim 1 wherein said pre-filtering module further includes a solid waste storage tank for temporarily storing solid waste.

6. The multi-phase separation system of Claim 1 wherein said condenser module includes a temporary storage tank for storing said contaminated liquid.

7. The multi-phase separation system of Claim 1 comprising a first carbon stage polisher for filtering said carrier air exiting from said condenser module.

8. The multi-phase separation system of Claim 1 wherein said phase reaction chamber includes a distribution header and a plurality of atomizer spray nozzles for converting said filtered contaminated fluid to said contaminated mist.

9. The multi-phase separation system of Claim 1 wherein said phase reaction chamber includes a mist eliminator for preventing said liquid mist phase from entering said vacuum pump.

10. The multi-phase separation system of Claim 1 wherein said phase reaction chamber includes a layer of packing material to facilitate the conversion of said liquid mist

phase to a plurality of liquid droplets.

11. The multi-phase separation system of Claim 10 wherein said phase reaction chamber further includes an air-water distribution tray for facilitating the drainage of said liquid droplets to a vacuum liquid discharge tank.

12. The multi-phase separation system of Claim 1 wherein said phase reaction chamber further includes an air-water distribution tray for facilitating the flow of said carrier air from a vacuum liquid discharge tank to said phase reaction chamber. 13. The multi-phase separation system of Claim 1 comprising a micron filtration bank module for blocking particles greater than five microns in diameter.

14. A multi-phase separation system for use in removing contaminants from fluids comprising:

a pre-filtering module for receiving and filtering a contaminated fluid to provide a filtered contaminated fluid;

a condenser module for receiving said filtered contaminated fluid and a contaminated gas phase for condensing said contaminated gas phase to a contaminated liquid;

a media temperature equilization module for receiving and equilizing the temperature of said filtered contaminated fluid and a carrier air;

a phase reaction module comprising a phase reaction chamber in communication with a vacuum liquid discharge tank, said phase reaction chamber converting said filtered contaminated fluid to a contaminated mist, said mist subjected to a low energy, high vacuum environment for providing a first change of phase by separating into said contaminated gas phase and a liquid mist phase, said contaminated gas phase being carried out of said phase reaction chamber by said
carrier air and said liquid mist phase being drained to said vacuum liquid discharge tank; and

a vacuum pump for providing said low energy, high vacuum environment in said phase reaction chamber and for delivering said contaminated gas phase to said condenser module to provide a second change of phase by said condensing.

15. The multi-phase separation system of Claim 14 wherein said phase reaction chamber communicates with said vacuum liquid discharge tank through a first three-way control valve.

16. The multi-phase separation system of Claim 15 wherein said first
three-way control valve is actuated by a pair of high-level and low-level float switches located within said vacuum liquid discharge tank.

17. The multi-phase separation system of Claim 14 wherein said vacuum liquid discharge tank further includes a second centrifugal pump for expelling a discharge liquid from said vacuum liquid discharge tank.

18. The multi-phase separation system of Claim 14 further including a liquid

discharge monitoring module for monitoring the quality of a discharge liquid from said vacuum liquid discharge tank.

19. The multi-phase separation system of Claim 18 wherein said liquid discharge monitoring module further includes a flow analyzer for analyzing the quality of said discharge liquid.

20. The multi-phase separation system of Claim 14 comprising a second carbon stage polisher for filtering said discharge liquid exiting from said liquid discharge monitoring module.

21. The multi-phase separation system of Claim 14 wherein said media temperature equilization module is a heat exchanger.

22. A multi-phase separation system for use in removing contaminants from fluids comprising:

a pre-filtering module for receiving and filtering a contaminated fluid to provide a filtered contaminated fluid;

a primary flow control module in communication with said pre-filtering module for receiving and regulating the flow of said filtered contaminated fluid;

a condenser module for receiving said filtered contaminated fluid and a contaminated gas phase for condensing said contaminated gas phase to a contaminated liquid;

a phase reaction module comprising a phase reaction chamber for converting said filtered contaminated fluid to a contaminated mist, said mist subjected to a low energy, high vacuum environment for providing a first change of phase by separating into said contaminated gas phase and a liquid mist phase, said contaminated gas phase being carried out of said phase reaction chamber by a carrier air; and

a vacuum pump for providing said low energy, high vacuum environment in said phase reaction chamber and for delivering said contaminated gas phase to said condenser module to provide a second change of phase by said condensing.

23. The multi-phase separation system of Claim 22 wherein said primary flow control module comprises a surge tank including a fluid level control mechanism for controlling the level of said filtered contaminated fluid.

24. The multi-phase separation system of Claim 22 wherein said primary flow control module further includes a first centrifu gal pump for pumping said filtered contaminated fluid.